

RECONSTITUTION OF THE DIAPERINI OF NORTH AMERICA, WITH
NEW SPECIES OF *ADELINA* AND *SITOPHAGUS*
(COLEOPTERA: TENEBRIONIDAE)

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Abstract.—The tenebrionid tribe Diaperini is redefined on the basis of larval and adult features, and the tribe is reconstituted for North America. A key to genera is provided. *Adelina latiramosa* and *Sitophagus alveolatus* are newly described and a key is provided for the North and Central American species of *Sitophagus*.

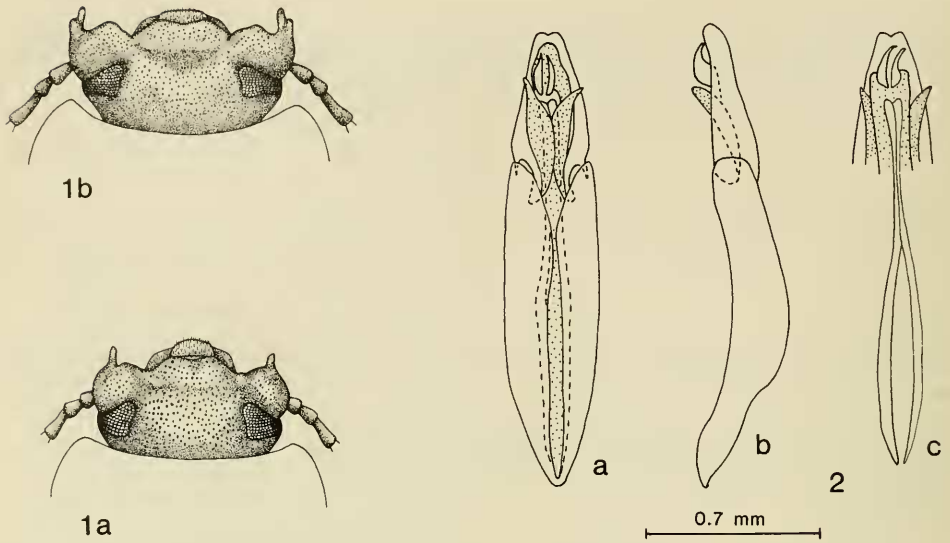
Adelina Dejean (= *Doliema* Pascoe; Spilman, 1973) and *Sitophagus* Mulsant are closely related genera presently included in the tenebrionid tribe Ulomini. *Adelina* has been recently revised by Ardoin (1977), but several new species, including one described here, occur in the New World Tropics. *Sitophagus* has never been revised and includes an undescribed North American species. Despite their superficial similarity to *Tribolium* and other members of Ulomini, *Adelina* and *Sitophagus* are similar in all important taxonomic features to Diaperini (Tschinkel and Doyen, 1980; Doyen and Tschinkel, 1982). The purposes of the present report, aside from proposing names for the new species, are to clarify the relationships of *Adelina* and *Sitophagus* and to reorganize the tribe Diaperini to reflect the results of recent morphological and phylogenetic analyses.

Adelina latiramosa, NEW SPECIES

Figs. 1-2

Male.—Strongly flattened, elongate oval, medium brown. Cranium (Fig. 1) dorsally with punctures much smaller than eye facets, separated by about 1-2 puncture diameters; epistomal suture strong, impressed medially, dark with depressed lateral extremities reaching clypeal margin; clypeus prominent, truncate or weakly indented in middle; genae expanded as foliaceous processes extending anterolaterad of eyes and terminating as slender, downcurved horns (Fig. 1a), bifid in large individuals (Fig. 1b). Antennae subfiliform, with segments longer than broad; segment length ratios as follows: 2.0:1.0:1.9:1.5:1.6:1.6:1.7:1.7:1.8:1.6:1.9. Eyes strongly emarginated by genal canthus; ventral lobe about twice size of dorsal. Mentum subquadrate, broader than long, with slender, sharply pointed projection in middle. Gular sutures confluent anteriorly.

Pronotal disk sculptured as cranium, finely margined except anteromedially, basal and apical widths subequal; anterior angles rounded, basal angles barely acute; posterior margin weakly, concavely bisinuate; hypomeron with punctation slightly denser, coarser; prosternal process nearly twice as broad behind as between coxae, sides nearly straight, apex broadly rounded.



Figs. 1-2. *Adelina latiramosa*. 1a, Dorsal aspect of head, small male; 1b, dorsal aspect of head, large male. 2, Aedeagus, a, ventral; b, lateral; c, detail of median lobe.

Elytral disk very weakly convex, 8th interstria angulate, with lateral portion subvertical; strial punctures subequal to eye facets in diameter, regularly separated by about one puncture diameter; interstriae very finely, moderately densely punctate. Mesosternum shallowly but distinctly concave; metasternum set with punctures nearly as large as eye facets, these becoming slightly larger and denser on metepisternum, abdominal sternites finely punctatorugulose. Femora strongly clavate, flattened; protibiae with dorsal margins bearing row of closely set, short, blunt spines; outer tibial spurs much larger, stouter than inner; meso- and meta-tibiae with dorsal edges bearing fine, irregular, crenulate ridge; inner spurs slightly larger than outer.

Aedeagus as in Fig. 2, with clavae fleshy, penis with sclerotized rods converging anteriorly, apex fleshy with paired, dorsally directed laciniae.

Elytral length, 3.9-4.5 mm; greatest elytral width, 2.4-2.6 mm; median pronotal length, 1.1-1.3 mm; greatest pronotal width 2.1-2.4 mm.

Female.—Unknown.

Holotype ♂ (California Academy of Sciences) and 2 paratypes from Mexico, Puebla, 45 mi. N Acatlan, July 30, 1963, J. T. Doyen.

Adelina latiramosa is similar to *A. bifurca* (Champion) in the shape of the genal projections. It differs from *bifurca* and all other described species in its strongly projecting, truncate clypeus (Fig. 1). It has the 8th elytral interstria angulate (carinate in *bifurca*).

The following modification in Ardoin's key (1977: 15) will accommodate *latiramosa*.

3. Elytral disk completely flat, the transition to the marginal, subvertical part marked throughout its length by a sharp carina. Fossae at the base of the pronotum large and deep 4

- Elytral disk slightly convex, the transition to the marginal subvertical part rounded, with a feeble carina apparent only behind the humerus. Fossae at the base of the pronotum reduced 3a
- 3a. Anterior margin of head bearing a pair of arcuate, anterodorsally directed horns arising just lateral to the clypeus; clypeus rounded *angustata* Champion
- Anterior margin of head expanded anterolaterally before the eyes as horizontal, foliaceous processes; clypeus truncate or medially indented. *latiramosa* new species

***Sitophagus alveolatus*, NEW SPECIES**

Figs. 3-4

Male.—Moderately flattened, elongate oval, medium to dark brown. Cranium (Fig. 3) dorsally with punctures about half eye facet diameter, separated by about one puncture diameter on frons, slightly sparser on clypeus; epistomal suture distinct, lateral arms meeting medial portion at nearly right angles; clypeus deeply, broadly emarginate medially, prominent laterally, subhorizontal and curved slightly inward; labroclypeal membrane broadly exposed. Antennae filiform at base, becoming serrate apically, with segments 7-10 about as broad as long; antennal length ratios as follows: 1.6:0.7:1.9:1.2:1.2:1.2:1.2:1.0:0.9:1.1. Eyes strongly emarginated by epistomal canthus; ventral lobe slightly larger than dorsal. Mentum trapezoidal, broader than long, convex with strong tumescence just behind anterior border bearing minute apical pore. Gular sutures confluent anteriorly.

Pronotal disk more finely, sparsely punctate than cranium, finely margined except anteromedially; apical width distinctly less than basal; lateral margins arcuate, more strongly so in anterior half; anterior angles rounded; posterior angles very narrowly rounded, barely obtuse; posterior margin distinctly bisinuate. Hypomeron and sternum finely punctatorugulose; prosternal process slightly wider behind than between coxae, declivous, rounded apically.

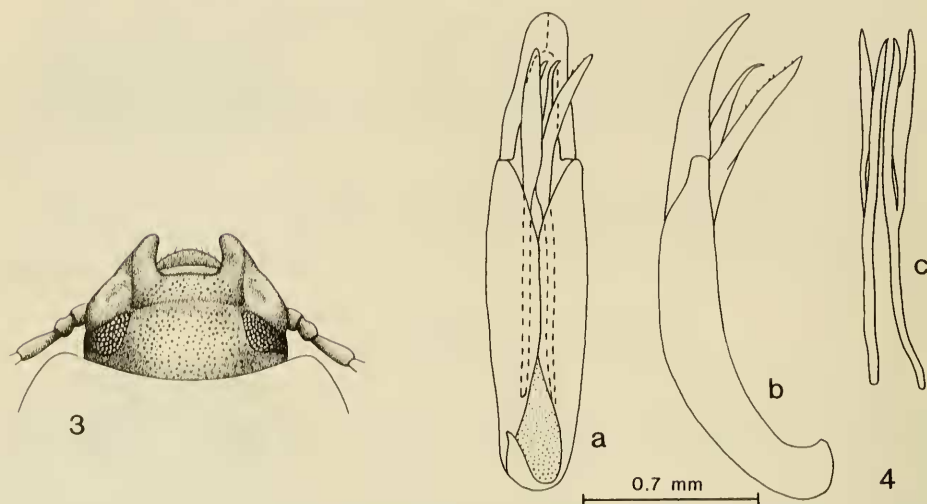
Elytral disk weakly convex, lateral margins evenly rounded; strial punctures slightly larger than eye facets, separated by about one puncture diameter; interstriae weakly convex, finely, sparsely punctate. Mesosternum moderately concave medially; metasternum with punctures as large as eye facets, separated by 1-2 puncture diameters, becoming nearly confluent on metepimeron; abdominal sternites anteriorly with punctures about as large as eye facets, separated by about one puncture diameter, becoming finer, sparser near posterior margin, and on 5th sternite. Femora strongly clavate, slightly flattened; protibiae bearing fine, crenulate ridge on dorsal face; tibial spurs subequal on all legs.

Aedeagus as in Fig. 4, with clavae fleshy with few extremely fine setae; penis with subparallel, sclerotized rods slightly downcurved at apex.

Elytral length, 4.3-4.8 mm; greatest elytral width, 2.3-2.6 mm; median pronotal length, 1.2-1.4 mm; greatest pronotal width, 2.1-2.3 mm.

Female.—Clypeus not produced laterally, moderately and narrowly emarginate medially, barely exposing labroclypeal membrane; mentum simply convex without anterior tumescence. Elytral length, 4.4-4.6 mm; greatest elytral width, 2.5-2.6 mm; pronotal length, 1.2-1.3 mm; greatest pronotal width, 1.9-2.2 mm.

Holotype ♂ (California Academy of Sciences) from Arizona, Cochise County, Rustler Park, Chiricahua Mountains, 8-9000 ft., July 27, 1927. Van Dyke Col-



Figs. 3-4. *Sitophagus alveolatus*. 3, Dorsal aspect of head of male. 4, Aedeagus; a, ventral; b, lateral; c, detail of median lobe.

lection. Paratypes as follows: Arizona, Rose Canyon, V-5-1963 (1 ♀); Cochise County, Chiricahua Mountains, 8500 ft., V-4-1969 (2 ♂♂); 6200 ft., VI-20-1928, A. A. Nichol (1 ♀); IX-14-1938, D. J. & J. N. Knull (1 ♂); 8000 ft., X-6-1974, K. Stephan (1 ♀); Huachuca Mountains, 9000 ft., VII-1929, H. H. Wenzel (1 ♀). Graham County, Graham Mountains, V-18-1969, K. Stephan (2 ♂♂); Navajo County, Springerville, IX-15-1972, K. Stephan (1 ♂, 1 ♀). Pima County, Rincon Mountains, IV-11-1976, K. Stephan (2 ♂♂); Santa Catalina Mountains, VII-1936, E. Ross (1 ♂); VII-1938, Bryant (3 ♂♂, 2 ♀♀); 7000 ft., XI-9-1974, K. Stephan (1 ♂); 8500 ft., IV-12-1969 (1 ♀); 7000 ft., IV-5-1967 (1 ♀); Mt. Lemon, IV-25-1970, K. Stephan (2 ♂♂).

Sitophagus alveolatus is similar to *fuliginosus* Champion in having the clypeus broadly, truncately emarginate. It differs in the subhorizontal clypeal processes, with the antennal orbits nearly flat (processes upturned, orbits raised in *fuliginosus*).

KEY TO ADULT *SITOPHAGUS* OF NORTH AND CENTRAL AMERICA

1. Head convex between eyes 2
- Head excavated between eyes (Fig. 5) *dilatifrons* Champion
- 2(1). Clypeus truncate between lateral projections (Fig. 3) 3
- Clypeus convex between lateral projections (Fig. 6)
..... *hololeptooides* Laporte
- 3(2). Antennal orbits swollen, upturned; lateral clypeal projections upcurved;
body shining black *fuliginosus* Champion
- Antennal orbits nearly flat; lateral clypeal projections subhorizontal;
body medium to dark brown *alveolatus* new species.

TAXONOMIC POSITION OF *ADELINA* AND *SITOPHAGUS*

Adults of *Adelina* and *Sitophagus* are strikingly modified for living beneath tightly adherent bark of dead trees. The broad body is strongly flattened, often

with a distinct, subvertical epipleuron defined by a fine carina just medial to the 8th stria. The antennae are unusually long for Tenebrionidae, reaching well beyond the pronotal base in most *Adelina*. Superficially these beetles resemble Cucujidae and, especially, Laemophloeidae, with which they are frequently found in collections that have not been examined by specialists. Both genera show strong sexual dimorphism. The epistomal region of the male is variably produced as foliaceous or horn-like expansions, and the frons and vertex are modified in some species.

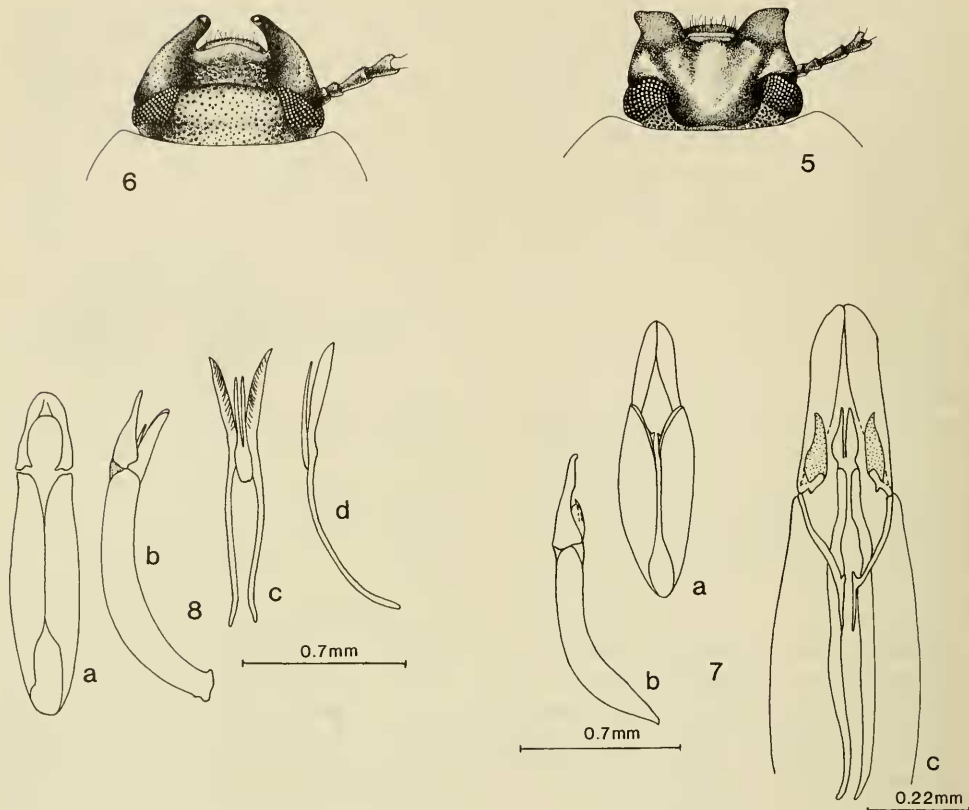
The phyletic relationships of *Adelina* and *Sitophagus* have never been properly interpreted, probably because of the morphological peculiarities mentioned above. LeConte (1862) placed *Adelina* in his Adelini, which was an assemblage of remotely related genera. Lacordaire (1859) included *Sitophagus* in his tenebrionides vrais (= Tenebrionini) and this placement was later accepted by Horn (1870) and LeConte and Horn (1883). Horn (1870) included in *Sitophagus* the species properly belonging in *Adelina*. Champion (1886) recognized two genera, *Doliema* (= *Adelina*) and *Sitophagus*, which he transferred to the Ulomini without specifying why. Subsequent cataloguers have accepted that position, and in the only recent papers dealing explicitly with these genera (Spilman, 1967, 1973; Ardoin, 1977) phyletic relationships were not addressed.

Tschinkel and Doyen (1980) noted that in three species of *Adelina* the structure of the female reproductive tract and defensive glands were similar to those of Diaperini. Based on this evidence and on similarities to Diaperini in wing configuration and venation, metendosternite structure and tentorial shape, Doyen and Tschinkel (1982: 182) suggested that *Doliema*, *Gnatocerus*, and perhaps other genera included in Ulomini should be transferred to Diaperini. The important characters supporting this placement are summarized in the following section.

Adelina and *Sitophagus* share a strikingly apomorphic aedeagal structure (Figs. 2, 4, 7, 8). The basal piece is much shorter than the parameres. The median lobe consists of a median structure which appears to be the intromittant organ and a pair of lateral lobes which move ventrolaterally when the organ is protruded from the aedeagal sheath. These structures are here termed the penis and clavae, respectively. Both penis and clavae vary in detail. In *Sitophagus alveolatus* the penis consists of a pair of sclerotized, lateral struts with slightly downturned apices (Fig. 4). The clavae are simple, membranous but rigid processes. In *S. hololeptoides* the clavae are setose (Fig. 8), and in *Adelina quadridentata* Champion they are secondarily attached to a baculus that hinges against the aedeagal sheath (Fig. 7). In *A. latiramosa* the apex of the penis is membranous with a pair of stout, upturned lacinae (Fig. 2).

Variation in male genitalia was noticed by Ardoin, who provided simplified diagrams of the aedeagi of *Adelina* species. Spilman (1967) had previously recognized the unusual nature of these structures, giving detailed descriptions of their configuration in *Doliodesmus* and *Doliopines* as well as some species of *Adelina* and *Sitophagus*. Further comparisons by me have shown that the same genitalic structure is shared by three other genera, *Cynaesus*, *Alphitophagus* and *Gnatocerus*. It may be expected that the morphologically similar *Iccius* Champion and *Sicinus* Champion have male genitalia of the same type.

This group of genera evidently forms a monophyletic lineage within the Diaperini. The most specialized genera are *Adelina* and *Gnatocerus*. *Alphitophagus*, which has traditionally been included in Diaperini, and *Cynaesus* are the most primitive in external features. Ecologically these beetles seem less specialized than



Figs. 5-8. 5, Dorsal aspect of head of *Sitophagus dilatifrons*. 6, *S. hololeptoides*. 7, Aedeagus of *Adelina quadridentata* Champion; a, ventral; b, lateral; c, detail of median lobe. 8, Aedeagus of *S. hololeptoides*; a, ventral; b, lateral; c, dorsal aspect of median lobe; d, lateral aspect of median lobe.

most other Diaperini, which largely feed on polypore fungi. The subcortical area of relatively old dead trees is the natural habitat of most, but *Alphitophagus* and *Cy-naeus* now occur in stored grain, where they apparently feed on fungi. Because of its morphological and ecological distinctness, nomenclatural recognition at the subtribal level is appropriate for this lineage. The proper name appears to be *Adelinina* LeConte (1862: 237). At present the remaining genera should be kept in a single subtribe, Diaperina, which may eventually need to be subdivided.

RECONSTITUTION OF DIAPERINI

In terms of internal structures the diaperine lineage (Doyen and Tschinkel, 1982) is one of the most distinctive and uniform groups of Tenebrionidae. The most important features characterizing the diaperine group are as follows: 1) The ovipositor has relatively large gonostyles, with the 4th coxite lobes relatively large and free. The 1st coxite lobe is small and folded under the second; 2) The internal female reproductive tract retains a bursa copulatrix. The basal portion of the spermathecal accessory gland is modified as a characteristic capsular spermatheca. In Diaperini the bursa copulatrix usually bears a circle of stiff, transparent cuticle; 3) The defensive gland reservoirs bear annular foldings in their walls; 4) The

Table 1. Distribution of important taxonomic characters among North American diaperine genera which have been examined in detail.

	Apsida	Metaclisa	Scaphidema	Adelina	Sitophagus	Gnatocerus	Alphitophagus	Dolopines	Doliodesmus	Cynaesus	Phayllus	Cosmonota	Platydemia	Lioderma	Palembus	Neomida	Pentaphyllus	Diaperis
Diaperine ♀ tract and ovipositor			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X ³
Tentorium looped		²	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Glands with helical folds				X	X	X	X	X	X	X	X	X	X ⁴	X	X	X	X	
Labroclypeal membrane exposed	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Mala without uncus			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Meso-, metatibia ridged				X	X ¹	X	X	X		X	X	X	X	X	X	X	X	X
Wing membrane elongate; recurrent cell reduced			X	X	X	X	X	X	X	X	X	X	X ⁴	X	X	X	X	X
Coelometopine ♀ tract and ovipositor	X																	
Tenebrionine ♀ tract		X																
Nonheteromeran trochanters			X															
Larval antenna 2-segmented			X															

¹ Present in *S. dilatifrons*.

² Absent.

³ Ovipositor strongly aberrant.

⁴ Sometimes intermediate.

tentorium has the bridge located anteriorly and looped far dorsally (Doyen and Tschinkel, 1982: Figs. 2-3); 5) The wings have the apical membranous portion relatively long, with the recurrent cell reduced or absent (Doyen and Tschinkel, Figs. 33-34). Two additional important apomorphies characterizing Diaperini were pointed out by Triplehorn (1965). First, the labroclypeal membrane is exposed. Second, the metatibia bears on its external (dorsal) surface a fine, crenulate longitudinal ridge. A similar ridge is often more strongly developed on the mesotibia.

This suite of characters is distributed among North American genera as shown in Table 1. Included are taxa traditionally but erroneously placed in Diaperini as well as taxa formerly in Ulomini but properly placed in Diaperini. The most important changes suggested by these data are as follows:

1) The group of genera constituting the subtribe Adelinina are undisputed members of Diaperini, sharing all or nearly all important features. The Ulomini, in which all of these genera except *Alphitophagus* were previously placed, differ fundamentally in all of the features described above (see Doyen and Tschinkel, 1982: 161-163). Their elongate, flattened body shape and specialized male genitalia differentiate Adelinina from Diaperina.

2) The genera *Phayllus* Champion and *Cosmonota* Blanchard show all the

important diaperine features, but lack the male genitalic specializations of the Adelinina. They are placed in the Diaperina. External characters suggest that *Lelegis* Champion, *Paniasis* Champion, and *Loxostethes* Triplehorn, which have not been dissected, certainly belong in Diaperini. Their relationships are discussed by Triplehorn (1962). *Stenoscapa* Bates is very similar to *Liodema* Horn of the Diaperina. *Saptine* Champion appears to be very similar to *Platydema*, but the type of the former lacks the head and prothorax.

3) The genus *Apsida* Lacordaire belongs to the coelometopine lineage of Doyen and Tschinkel, probably to Cnodalonini. *Apsida* shows the very distinctive ovipositor and female reproductive tract of the coelometopine lineage (Doyen and Tschinkel, 1982: 164–165), and conforms in wing, tentorial and defensive gland configuration. As in other coelometopines and cnodalonines the tarsae bear densely setose pads and the tibiae are apically setose. *Gonospa* Champion belongs near *Apsida* in Coelometopini, but I have not made dissections.

4) *Metaclisa*, excluded from Diaperini by Arnett (1960) and Triplehorn (1965) belongs to the tenebrionine lineage of Doyen and Tschinkel, where it fits conveniently into the Tenebrionini.

5) *Scaphidema* has traditionally been placed in Diaperini, but with reservations because of its atypical external structures such as widely separated meso- and metacoxae. The internal female reproductive tract and defensive glands deviate from the diaperine pattern, and the ovipositor is more primitive, with the large 4th coxite lobes entirely free. These characters are shared with the Australian *Spiloscapa* Bates. Both genera have anterior trochanters which are not overlapped laterally by the femora (nonheteromeran trochanters of Watt, 1974), and lack the tentorial bridge. Their larvae have distinct urogomphi and antennae with the 3rd segment greatly reduced, without a strip of cuticle between the antennal base and mandible. These and other characters indicate that *Scaphidema* and *Spiloscapa* are the most primitive members of the tribe Nilionini, which will be treated in more detail in the future (Doyen and Lawrence, in prep.).

Uloporus Casey and *Menimopsis* Champion, included in Diaperini in previous classifications, have previously been removed to the Archeocrypticidae (Lawrence, 1977; Triplehorn and Wheeler, 1979) and Gnathidiini (Doyen and Lawrence, 1979), respectively. Kaszab (1981) subsequently synonymized *Uloporus* under *Enneboeus* (Waterhouse).

Even after the removal of the Adelinina, the tribe Ulomini remains composite. *Uloma* and its relatives are strongly differentiated in external as well as some internal characters. Ulomini should be restricted to this group, represented in North America by *Uloma* Laporte, *Eutochia* LeConte, *Alegoria* Laporte, *Uleda* Laporte, *Antimachus* Gistel and possibly *Ulosonia* Laporte. *Tribolium* McLeay, *Palorus* Mulsant, *Latheticus* Waterhouse, *Lyphia* Mulsant & Rey, *Mycotrogus* Horn and *Tharsus* LeConte are phenetically more similar to *Tenebrio*, and should be provisionally moved to Tenebrionini. That tribe is presently composite, containing many members of Coelometopini and Cnodalonini. Limits of these tribes will be specified in future work (Doyen, in prep.).

The rearrangements proposed above will make present keys to tribes inadequate. It may be pointed out that Diaperini cannot be keyed to tribe in Arnett (1960). In the key to tribes of Tenebrionini, couplet 2b, presence of an external labroclypeal membrane, would lead to couplet 21 and thence to the tribes Helopini or

Strongyliini. Because of the numerous rearrangements still required in tribes such as Tenebrionini it is premature to construct a new key at present. The following minor change in Arnett's key will accommodate most Diaperini.

- 2 (1). Epistoma without a membranous margin or a membranous band between it and labrum 3
 – Epistoma with a membranous margin or a membranous band between it and labrum 2a
 2a(2). Middle and hind tibiae bearing a longitudinal, finely crenulate carina on the outer (dorsal) margin Diaperini
 – Middle and hind tibiae lacking carina on outer margin 21

Tribe Diaperini, new sense

Diaperales Latreille, 1802: 161.

Diaperides Redtenbacher, 1845: 128; Lacordaire, 1859: 298.

Adult.—Small to moderate (2–15 mm), elongate to subglobular, flattened to convex. Eyes large, anteriorly emarginate, or occasionally small, entire; antennae gradually enlarged or bearing distinct 5–8 segmented club; apical 5–7 segments bearing large, stellate sensoriae; labrum strongly transverse, basal membrane almost always exposed; mandible with mola finely, transversely striate, rarely flat or highly modified; lacinia finely setose, without uncus; palp subcylindrical or weakly triangular; tentorium with bridge anterior, strongly arched dorsad. Apical membrane at least 33% wing length; recurrent cell much reduced or absent; meso- and metatibiae bearing fine, crenulate ridge on outer (posterior) surface, or rarely smooth; mesocoxal cavities closed by mesepimeron or meso- and metasterna; metendosternite with arms usually expanded as apical muscle disks. Ovipositor with gonostyles terminal, moderate in size; coxite with basal lobe reduced, folded under second lobe; or ovipositor highly modified (*Diaperis*). Internal female reproductive tract with bursa copulatrix, capsular spermatheca at base of accessory gland. Defensive reservoirs without common volume; reservoir walls usually with annular folding; secretory tissue drained by basal line of ducts or few large collecting ducts. Aedeagus with tegmen dorsal; median lobe free or occasionally adnate, or aedeagus highly modified.

Larva.—Cylindrical or subcylindrical, slender to moderately stout, tapering somewhat posteriorly, moderately sclerotized and pigmented to weakly sclerotized, cream colored; ocelli present or absent.

Antennae 3 segmented; second segment about twice length of basal, bearing C-shaped sensorium near apex; third segment a digitate process, less than half length of second and bearing a single long and several short setae at apex. Labrum about as wide as long to distinctly transverse, with semicircular anterior margin; tormae submedial, projecting strongly backward; epipharynx with asymmetrical masticatory processes. Mandibles asymmetrical; right mola lacking transverse ridges, developed at apex as blunt prominence; left mola set with fine transverse ridges, apical surface receding. Maxillae with mala rounded, without uncus or indentations, setose or spinose on medial surface. Labium with subtrapezoidal hypopharyngeal sclerome set behind setose prominence; ligula short to moderate, bearing 2–4 apical setae. Thoracic legs slender, similar in size and structure, bearing slender setae. Ninth abdominal tergite much larger than sternite, with

projecting, acutely rounded or pointed apex, or shorter, bluntly rounded with median, bifid tubercle (*Diaperis*); anus subterminal; pygopods moderate to large, glabrous or very finely, sparsely setose. Spiracles simple annular or with peripheral air tubes (*Diaperis*).

Subtribe Adelinina

Adelinini LeConte, 1862: 237.

Doliemini Reitter, 1917: 58, Kwieton, 1982: 98.

Gnatocerini Skopin, 1978: 228.

Flattened, elongate oval beetles, antennae gradually enlarged; eyes narrower than frons across epistomal canthus (exception, *Alphitophagus*); mesocoxal cavities closed by sterna; epipleuron abruptly narrowed near anterior margin of 5th abdominal sternite; aedeagus with clavae.

Included North American genera: *Adelina* Dejean; *Sitophagus* Mulsant; *Gnaticerus* Thunberg (including *Sicinus* Champion); *Iccius* Champion; *Alphitophagus* Stephens; *Doliopines* Horn; *Doliodesmus* Spilman; *Cynaesus* LeConte.

Described members of this lineage are native to the New World, with the exception of *Doliema turcica* Redtenbacher, *nitidula* Macleay, *ferruginea* Kaszab, *platisoides* Pascoe and *tenuicornis* Fairmaire. The type of *platisoides* (the generitype) is very similar in general appearance to the New World species of *Adelina*. It bears serrulate ridges on the hind tibiae and compound sensoria on the apical 6 antennomeres. On this basis it is provisionally included in Adelinina. However, *nitidula* lacks ridges on the hind tibiae, has simple antennal sensoria, and shows none of the diagnostic internal features of Diaperini. It properly belongs to *Platycotylus* Olliff, originally described in Cucujidae, but probably close to *Lorelus* (Tenebrionidae; Lagriinae) (Doyen and Lawrence, in preparation). The remaining species have not been examined. The name *Doliema* should be retained for the Old World species (except *nitidula*) until more detailed comparisons have been made, especially of internal structures.

Subtribe Diaperina

Diaperales Latreille, 1802: 161.

Diaperides Redtenbacher, 1845: 128; Lacordaire, 1859: 298.

Globular or short oval beetles. Antennae gradually enlarged or with distinct 5–8 segmented club; eyes exceeding epistomal canthi; mesocoxal cavities closed by mesepimeron (exception, *Pentaphyllus*); epipleuron gradually narrowed to elytral apex (exception, *Diaperis*, some *Neomida*); aedeagus without clavae.

Included North American genera: *Diaperis* Müller; *Pentaphyllus* Dejean; *Neomida* Latreille; *Palembus* Casey; *Liodema* Horn; *Platydemia* LaPorte & Brullé; *Leligis* Champion; *Paniasis* Champion; *Loxostethes* Triplehorn; *Phayllus* Champion; *Saptine* Champion; *Stenoscapa* Bates.

This subtribe is nearly cosmopolitan and includes the Old World genera *Basanus* Lacordaire, *Ischnodactylus* Chevrolat, *Ceropria* Laporte & Brullé, and probably most other names presently included in Diaperini.

The variation in antennal form, epipleuron shape and in larval 9th segment configuration (see Hayashi, 1966) suggests that Diaperina is composite. Two groups

of genera are apparent. *Diaperis*, *Pentaphyllus*, *Neomida*, and *Loxostethes* are strongly convex, with the antennae distinctly clubbed. *Platydema*, *Liodema stenoscapha*, *Lelegis*, *Paniasis*, *Phayllus* and *Saptine* are less convex, with the antennae gradually enlarged. *Palembus* seems intermediate, with weakly convex body but distinctly clubbed antennae. *Diaperis*, especially, is aberrant. Its peculiarities have been discussed by Watt (1974: 405–407) and Doyen and Tschinkel (1982: 163).

KEY TO THE GENERA OF ADULT DIAPERINI NORTH OF MEXICO

- | | | |
|---------|---|-----------------------------------|
| 1. | Antennae with terminal 5–8 segments enlarged as distinct club . . . | 2 |
| – | Antennae gradually enlarged to apex, or subfiliform | 5 |
| 2(1). | Antennal club of 6–8 enlarged segments; eyes emarginate anteriorly | 3 |
| – | Antennal club of 5 segments; eyes round, not at all emarginate | <i>Pentaphyllus</i> Dejean |
| 3(2). | Ventral distance between eyes greater than width of oral fossa; epipleuron usually narrowed abruptly near anterior margin of 5th sternite | 4 |
| – | Ventral distance between eyes less than width of oral fossa; epipleuron narrowing gradually to elytral apex | <i>Palembus</i> Casy |
| 4(3). | Body broadly oval, strongly convex; without frontal horns; body length greater than 4 mm | <i>Diaperis</i> Müller |
| – | Body elongate oval, subcylindrical; males with frontal horns, females with tubercles; body length less than 5 mm | <i>Neomida</i> Latreille |
| 5(1). | Mesocoxal cavities closed by meso- and metasterna | 7 |
| – | Mesocoxal cavities bordered laterally by mesepimeron | 6 |
| 6(5). | Mesosternum concave between middle coxae | <i>Platydema</i> LaPorte & Brullé |
| – | Mesosternum projecting anterad as prominent, horizontal lobes | <i>Liodema</i> Horn |
| 7(5). | Epipleuron narrowed abruptly near anterior margin of 5th sternite; dorsum glabrous | 8 |
| – | Epipleuron narrowed gradually to elytral apex; dorsum setose | <i>Alphitophagus</i> Stephens |
| 8(7). | Posterior pronotal corners angulate, sharp | 10 |
| – | Posterior pronotal corners broadly rounded | 9 |
| 9(8). | Antennal segment 4 about 1.5 times length of 2; meso- and metatibiae with outer surface evenly convex | <i>Doliodesmus</i> Spilman |
| – | Antennal segment 4 about 2.5 times length of 2; meso- and metatibiae bearing fine, crenulate ridge on outer surface | <i>Doliopines</i> Horn |
| 10(8). | Elytra with 8th interval simply convex or nearly flat; antennae with segments 8–10 at least as wide as long | 11 |
| – | Elytra with 8th interval sharply angulate, usually weakly carinate; antennae with segments 8–10 longer than wide | <i>Adelina</i> Dejean |
| 11(10). | Posterior pronotal border bisinuate; mandible normal | 12 |
| – | Posterior pronotal border evenly convex, mandibles of males bearing dorsal horns | <i>Gnatocerus</i> Thunberg |
| 12(11). | Pronotal disk evenly convex; anterior corners angulate | <i>Cynaesus</i> LeConte |

- Pronotal disk flat medially, declivous laterally, especially near front margin; anterior corners rounded *Sitophagus* Mulsant

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NOTE

A New Synonym in *Hexagenia* (Ephemeroptera: Ephemeridae)

The common burrowing mayfly, *Hexagenia limbata* (Serville), has recently been shown in field and laboratory experiments by McCafferty and Pereira (1984. Ann. Entomol. Soc. Am. 77: 69–87) to be highly variable, with the source of much of this variability being attributable to temperatures of the developmental environment. That study also showed that the range of variability included all of the color pattern characteristics previously associated with *Hexagenia munda* Eaton, with particular reference to the abdomen but also including the lack of costal crossvein margination and the color of the costal membrane, both of which were used by Spieth (1941. Amer. Midl. Nat. 26: 239) to key *H. munda* from *H. limbata*. The shape of the penes has also been proposed as a distinguishing specific character. After many years of identifying *Hexagenia* from throughout North America (*H. limbata* and *H. munda* are reportedly sympatric over most of eastern N.A., McCafferty, 1975. Trans. Am. Entomol. Soc. 101: 470), I have found these possible penes differences indiscernible. B. C. Kondratieff (pers. comm., 1983) has also not been able to discern supposed penes differences and has seriously doubted the validity of *H. munda*. Differences in curvature of the penes drawn by Spieth (1941: 278) are miniscule and can be duplicated in many *limbata* specimens by a slight rotation, or by the angle of view in a slide mount. Even if such differences occur, they would appear to represent only slight intraspecific variability, particularly in light of the extreme range of variability of other characters of *H. limbata*.

Underlying abdominal color pattern of the adults that has been used to attempt to distinguish larvae of *H. munda* expresses only a known variation of *H. limbata*. I have also determined that tusk length varies considerably in *H. limbata* larvae and includes size differences previously suspected of being specific for some *H. munda*.

On the basis of the above I designate *H. munda* Eaton as a NEW JUNIOR SYNONYM of *H. limbata* (Serville). Fourteen specific epithets are now referable to *H. limbata*, including seven that have been synonymized with *H. munda*.

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